DOCUMENT RESUME

ED 243 422 IR 011 031

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TITLE The Relative Effectiveness of Pictures versus Words in Conveying Abstract and Concrete Prose.
PUB DATE Jan 84
NOTE 20p.; Paper presented at the Annual Meeting of the Association for Educational Communications and Technology (Dallas, TX, January 20-24, 1984). For proceedings, see IR 011 020.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Abstract Reasoning; Elementary Education; Grade 3; Grade 4; Media Research; *Pictorial Stimuli; *Prose; *Recall (Psychology); *Teaching Methods; *Verbal Stimuli; Visual Aids

ABSTRACT

A total of 121 third and fourth graders were randomly assigned to instructional treatments which each featured a short children's story. The treatments were oral-only, picture-only, and a combination of oral and pictures. Students saw and/or heard the presentation and were tested immediately and after a two-week retention interval for recall of abstract and concrete presentation content. As expected, the combined presentation yielded the greatest recall of both abstract and concrete content. Oral-only and picture-only presentations were equally effective for abstract content, but the picture presentation was more effective for concrete content. In effect, picture presentations were relatively more effective overall than oral-only presentations. Twenty-one references are listed. (Author)

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ED243422

THE RELATIVE EFFECTIVENESS OF PICTURES VERSUS WORDS IN CONVEYING ABSTRACT AND CONCRETE PROSE

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Presented at the Annual Meeting of the Association for Educational Communications and Technology, Dallas, January 1984.

IR011031

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ABSTRACT

A total of 121 third and fourth graders were randomly assigned to instructional treatments which each featured a short children's story. The treatments were oral-only, picture-only, and a combination of oral and pictures. Students saw and/or heard the presentation and were tested immediately and after a two-week retnetion interval for recall of abstract and concrete presentation content. As expected, the combined presentation yielded the greates recall of both abstract and concrete content. Oral-only and picture-only presentations were equally effective for abstract content, but the picture presentation was more effective for concrete content. In effect, picture presentation were relatively more effective overall than oral-only presentations.

THE RELATIVE EFFECTIVENESS OF PICTURES VERSUS WORDS IN CONVEYING ABSTRACT AND CONCRETE PROSE

The ability to derive meaning from prose is of major importance in classroom learning settings. A large percentage of classroom instruction is presented to prospective learners through oral or written prose. Prose learning typically involves different information processing skills from simple paired associate or serial learning tasks. For example, contextual and inferential learning are more often associated with prose learning than other types of isolated learning tasks. Consequently, much of the non-prose research regarding presentation stimuli effects may not be readily generalizable to prose learning tasks. For these reasons, the continued investigation of prose learning effects warrants attention.

The mythical best audiovisual presentation medium has been pursued extensively during the past several years. The supplementary effect of pictures when applied to oral presentations has also been investigated. Levin and Lesgold (1978) listed several conditions under which pictures facilitate the learning of oral prose: learners should be children rather than adults, pictures must overlap with story content, and learning should be demonstrated by factual recall. Researchers have generally found that pictures are effective supplements to prose when such pictures are well designed and congruent with prose content and sequence (Carrier & Clark, 1978; Haring & Fry, 1979; Lesgold, Curtis, &

DeGood, 1975; Lesgold, Levin, Shimron, & Guttmann, 1975; Levin, Bender, & Lesgold, 1976; Levin & Berry, 1980; Peng & Levin, 1979; Pressley, 1977; Rusted & Coltheart, 1979).

Although the use of well-designed and congruent pictures has resulted in positive effects on learning when paired with different types of prose, the relative information carrying value of verbal and picture presentations is unclear. Many researchers who have compared the effectiveness of verbal and pictorial presentations of the same information have concluded that verbal presentations are generally more effective than pictorial presentation. However, these findings are by no means conclusive (Fleming, 1979). Conflicting results have been reported recently (e.g., Rohwer & Harris, 1975 vs. Hannafin, 1981). Consequently definitive conclusions regarding the relative effectiveness of different presentation stimulu are not readily derived from existing research.

Some studies designed to investigate the relative effectiveness of pictures and verbal presentations may have been confounded by loading effects, i.e., effects due to differentially loading either verbal or visual presentations with criterion information (Hannafin, 1983). While loading bias often reflects accurately a natural weighting of information found in many materials, it is unlikely that the potential of a given medium to transmit information is accurately assessed using such materials. Recently, researchers have found that both verbal and pictorial presentations enhance student learning when each presentation is systematically and equally loaded with criterion information (Carey & Hannafin, 1981).

The type of information to be remembered in prose learning also warrants further study (Salomon & Clark, 1977). Paivio (1971) suggested that the most powerful factor that determines how well information will be remembered is its location on a continuum of concreteness-abstractness: The more concrete, the more easily remembered; the more abstract, the harder to remember. Paivio and Foth (1970) further suggested that the concreteness or abstractness of information interacts with the stimulus attributes of the presentation medium. Verbal presentations may be more effective than visual presentations for teaching abstract information and visual presentations may be more effective than verbal presentations for teaching concrete information. Research findings, however, have not consistently supported this hypothesis. Other resarchers have found that although visual presentations are more effective than verbal presentations in communicating concrete information, no significant differences exist between visual and verbal presentations in communicating abstract information (Hannafin, 1981, 1983). The nature or existence of Paivio and Foth's (1970) postulated interaction between presentation medium and relative concreteness of information to be learned, therefore, remains unclear.

The purposes of the present student were to investigate the relative effectiveness of different verbal versus pictorial audiovisual presentations on student recall of concrete and abstract prose.

METHODS

Subjects

A total of 60 third-grade and 60 fourth-grade students served as subjects. Students were selected from either of two schools located in a predominantly middle-class suburban school district.

Materials

Three presentations, each depicting an adapted children's text, The Wump World (Peet, 1970), were used. Each of the story versions was systematically loaded with both concrete and abstract criterion information. The Wump World is a high interest, animated story with a Spache graded readability estimate of 4.8. The story was slightly adapted to include both concrete and abstract information. The three presentations included: ORAL, an audiotape verbal presentation of the story; PICS, a 35-mm slide presentation of the text pictures used to depict the story; and ORAL + PICS, a combination of the audiotape and 35-mm lides.

Each of the presentation versions was 18 minutes in duration and paced identically to control student time on task.

Criterion Measure

The criterion measure was a 24-item short-answer test, consisting of 12 items measuring recall of abstract information presented in the story and 12 items measuring recall of concrete information. The concreteness-abstractness of the test information, where possible, was

based on the ratings provided by Paivio et al. (1968). Reliability coefficients for the 24-item test used in the present study were .76 for the 12-item abstract scale, .85 for the 12-item concrete scale, and .87 for the full-length criterion test.

All test directions and questions were presented and paced via audiotape.

Procedures

Students were randomly assigned to presentation treatment group assignments. Students then heard and/or viewed The Wump World in accordance with presentation group assignments. Following the presentation, there was a brief interpolated activity during which the students stood and stretched at their assigned seats while test answer sheets were distributed to them.

The criterion test was administered both as a measure of immediate recall and also one week after the initial story presentation as a measure of delayed recall and retention. The delayed test was administered to all students in their home classrooms.

Design and Data Analysis

The research design was a completely crossed 3 x 2 x 2 factorial design with repeated measures on both the test scale and the test interval. The three levels of presentation (ORAL, PICS, and ORAL + PICS) were crossed with two levels of ability (HI and LO), and both factors were crossed with grade level (THIRD and FOURTH). The learner ability classifications were based upon a median split of student scores

on a group-administered standardized intelligence test. The test scale yielded immediate and delayed scores for concrete and abstract information.

In addition to the immediate and delayed scores for concrete and abstract information, a relative effectiveness score was derived by subtracting the concrete score from the corresponding abstract score for the immediate test, the delayed test, and the overall repeated measure.

Due to chance cell imbalance, resulting primarily from attrition, students were randomly eliminated from the analysis in order to balance the cell sizes.

Separate repeated measure MANOVAs were conducted for recall and for the relative effectiveness scores. In addition, planned orthogonal contrasts were conducted for each anticipated effect source.

RESULTS

Recall Effects

The mean recall scores for both abstract and concrete scales are contained in Table 1. As expected, recall of concrete information was significantly greater than abstract recall, $F(1,108)= 15.83$, $p<.0001$. The results further indicated significant presentation group differences, $F(2,108)=13.81, p<.0001$, and a presentation by scale interaction $F(2,108)=6.21, p<.005$. The ORAL + PICS presentation was consistently the most effective for both abstract and concrete recall. The mean scores obtained by the ORAL and PICS presentation groups for abstract recall were comparable but the PICS presentation was significantly more effective than the ORAL presentation for recall of concrete content.

Expected differences were also found for learner ability, $F(1,108)=13.57, p<.001$. HI ability learners consistently out performed LO learners across scale, test interval, presentation, and grade level.

Grade level effects were also found for test recall, $F(1,180)=4.73, p<.05$, and the grade level-by-test scale interation $F(1,108)=9.02, p<.005$. Fourth graders consistently, but marginally, out-performed third graders. The differences were most pronounced for concrete recall, where fourth graders recalled proportionately greater information than third graders.

Insert Table 1 About Here

Relative Effectiveness Scores

The relative effectiveness scores, measures of the difference in student recall of abstract and concrete information, are shown for both the immediate and the delayed test in Table 2. The scores indicate the direction and magnitude in which differences in learning occurred: positive scores indicate greater learning of abstract than concrete content; negative scores indicate greater learning of concrete than abstract content.

Differences in relative effectiveness were found for presntation group, $F(2,108)=6.21, p<.005$, and for grade level, $F(1,108)=9.02, p<.005$. The ORAL + PICS presentation yielded greater relative effectiveness differences than either the PICS or the ORAL presentation ($p<.01$).

Similar differences were found between the PICS and the ORAL presentations ($p<.01$) with relatively greater learning of concrete information than abstract information in the PICS and ORAL + PICS presentations, and slightly greater learning of abstract information under the ORAL presentation. These differences were most pronounced for the fourth graders, with relatively greater concrete than abstract learning.

No other significant differences were found.

Insert Table 2 About Here

DISCUSSION

The present study was conducted to determine the relative effectiveness of different prose presentation forms on the learning of concrete and abstract prose. The results indicated that student learning of both abstract and concrete prose was differentially affected by the form of prose presentation.

The combined oral-plus-pictures presentation yielded the highest recall of both concrete and abstract content. Although this result was expected, the magnitude of the performance difference between the oral-plus-picture presentation and both the oral and pictures presentation is noteworthy. As noted by several researchers (Lesgold, Levin, Shimron, & Guttman, 1975; Levin et al., 1976; Pressley, 1977), well-designed and congruent pictures are effective supplements to oral or written prose. However, the relative supplementary contribution of pictures to oral prose or oral prose to pictures has been unclear. In the present study, pictures were found to be highly effective supplements to the oral prose presentation. The oral-plus-pictures presentations resulted in significantly greater recall of both abstract content and concrete content than the oral-only presentation. The difference was greatest for concrete content, where the mean score for the oral-plus-pictures presentation was more than double the mean score for the oral presentation. This result suggests that the supplementary value of pictures, although evident for both concrete and abstract content, may be most pronounced for concrete content.

Performance was also improved through the addition of the oral

component to pictures depicting prose. However, the supplementary effect of the oral presentation to pictures, demonstrated by the performance differences between the picture-only presentation and the oral-plus-picture presentations, was less pronounced and more consistent than the oral-only versus oral-plus-presentation. The contrast between the effects of picture versus oral story supplements suggests that well-designed pictures may be more effective supplements to oral prose than oral story supplements are to pictured prose. In addition, the relative effectiveness of picture supplements may be affected by the type of information, concrete or abstract, to be learned from the presentation.

The finding that the systematically loaded picture presentation was equal in effectiveness to the oral presentation in conveying abstract content is of particular interest. These findings provide additional support for the conclusions made by previous researchers (Hannafin, 1983). The results could be related to the clarity of each medium in communicating abstract or concrete content to learners, since learner acquisition undoubtedly is affected by the clarity of the presentation medium in conveying the information. Concrete information, as defined in the present study, can be presented unambiguously in both pictures and words. Abstract information, on the other hand, may be more difficult to present unambiguously in pictures than in words because it tends to be subject to greater interpretation when portrayed in picture form. Consequently, student learning from pictures is likely to be greatest when the picturability of the content is unambiguous. Thus, picture presentations would be more effective for concrete content than

for abstract content.

The manner in which information is represented internally by learners could provide a further explanation of the differences in performanc by presentation. Presentations that include combined oral and picture forms typically require less interpretation by learners and result in greater learning. In order to produce a verbal response to demonstrate the recall of information presented initially in pictured form only, however, at least two steps are required. The learner first must encode the picture and then must label the picture verbally. Oral presentations do not require a transformation of the information from one form to the other since both presentation and response modes are verbal in nature (Kosslyn, 1978, 1980). Consequently, an ordering of learning outcomes might be predicted based upon the modality required to encode presented information and the modality required to produce a response to demonstrate acquisition of information. In the present study, the presentations that include both oral and picture forms resulted in the greatest learning; presentations that included only picture forms yielded the next most effective learning, and presentations that included only the oral form produced the least effective learning. This pattern was more pronounced for concrete content than abstract content, since the difference between the oral and picture presentations was significant only for concrete content. The pattern of performance by presentation group was identical for abstract content, although the difference was not statistically reliable. As suggested earlier, this could be related to the greater claity of pictures in conveying concrete content than abstract content.

The results of the analysis of relative learning of abstract and concrete content within each presentation indicate that the type of information to be learned interacts with the presentation medium. Educators frequently evaluate the effectiveness of instructional products based upon the degree to which intended learning results from the use of the products. In the present study, intended learning included both abstract and concrete prose content. Students in oral presentations recalled relatively more abstract content than concrete content, while students in picture and oral-plus-picture presentations recalled more concrete content than abstract content. The effectiveness of presentation media, therefore, appears to be affected partially by the type of information, concrete or abstract, to be conveyed to learners.

In the present study, a number of issues pertaining to the relative effectiveness of different presentation stimuli have been raised and tested. Certainly, it is unlikely that even the most enthusiastic of "picture researchers" will advocate the wholesale scrapping of oral-aural instruction in favor of visual-only instruction. It is important to note, however, that much of the cognitive psychology and human learning literature has also emphasized the functions and effectiveness of visual images in encoding, retaining, and decoding information for skills ranging from simple list learning to recall of prose facts and features. Perhaps the instructional technology profession, and the picture research component in-particular, will expand the notions of the external stimuli to include the internal processing component of learning from pictures.

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Table 1

Mean Recall Scores for the Immediate Test and the Retention Test

Grade Level	Abil.	Presentation: ORAL Abs	ORAL Con	PICS Abs	PICS Con	ORAL+PICS Abs	ORAL+PICS Con	Totals Abs	Totals Con
Immediate Test									
Third	HI	3.1	3.1	3.9	3.6	5.5	6.6	4.2	4.4
	LO	2.9	2.4	2.6	2.8	4.9	5.5	3.5	3.6
Fourth	HI	3.9	4.6	5.3	6.6	5.6	7.9	4.9	6.4
	LO	2.5	2.7	3.7	5.6	3.7	5.6	3.3	4.6
Totals	HI	3.5	3.8	4.6	5.1	5.5	7.2	4.5	5.4
Retention Test									
Third	HI	4.3	3.7	3.7	4.3	5.7	6.8	4.6	6.6
	LO	2.6	2.0	3.0	7.0	5.5	5.7	3.7	4.9
Fourth	HI	4.8	4.7	5.1	3.1	5.9	7.9	5.3	5.2
	LO	3.1	2.7	3.9	5.2	3.8	5.2	3.6	4.4
Totals	HI	4.5	4.2	4.4	3.7	5.8	7.4	4.9	5.1
	LO	2.8	2.4	3.5	6.1	4.7	5.5	3.7	4.7

Notes. Abs = Abstract Scale; Con = Concrete Scale. Total points possible for each scale = 12.

Table 2

Relative Effectiveness Scores for Immediate Test and Retention Test

Grade Level	Abil	Presentation: ORAL	PICS	ORAL+PICS	Totals
Immediate Test					
Third	HI	0.00	.33	-1.10	-.27
	LO	.50	-.20	-.60	-.10
Fourth	HI	-.70	-1.36	-2.30	-1.45
	LO	-.20	-2.36	-1.78	-1.45
Totals	HI	-.35	-.52	-1.70	-.86
	LO	.15	-1.28	-1.19	-.78
Retention Test					
Third	HI	.60	-.67	-1.10	-.39
	LO	.60	-.10	-.20	.10
Fourth	HI	.10	-1.91	-2.00	-1.27
	LO	.40	-1.27	-1.44	-.77
Totals	HI	.35	-1.29	-1.55	-.83
	LO	.50	-.69	-.82	-.38

Notes. Relative Effectiveness Scores computed by subtracting the Concrete Scale score from the Abstract Scale Score. Negative valences indicate greater concrete than abstract learning.